

What is claimed is:

1. Apparatus for recovering and generating clock and data signals from information received on a transmission line comprising

clock detecting means for recovering and generating a clock signal from the

5 received transmission line information;

data detecting means enabled by the recovered clock signal for recovering and generating data contained in the received transmission line information; and

directional coupling means having magnetically coupled microstrip lines coupled with the transmission line for receiving the transmission line information and with the clock and data detecting means for applying the received transmission line information to the clock and data detecting means.

2. The clock and data signal recovery and generating apparatus set forth in claim 1 wherein the directional coupling means comprises;

a pair of magnetically coupled microstrip transmission lines positioned in a parallel relationship with one microstrip transmission line for receiving and applying the transmission line information to the data detecting means and for magnetically coupling the received transmission line information to the other microstrip transmission line for transmission to the clock detecting means.

3. The clock and data signal recovery and generating apparatus set forth in claim 2 further comprising;

a class B narrow band amplifier having an input connected to the other microstrip transmission line for receiving the magnetically coupled transmission line information and amplifying positive and negative pulses of the received transmission line information and applying the amplified pulses as a distorted sine wave to the clock detecting means.

4. The clock and data signal recovery and generating apparatus set forth in claim 3, wherein the clock detecting means comprises;

a narrow band filter connected to an output of the class B narrow band amplifier for limiting frequencies of the amplified pulses of the distorted sine wave to signals  
5 defining a spectral power density corresponding to a clock rate of the received transmission line information.

5. The clock and data signal recovery and generating apparatus set forth in claim 4, wherein the clock detecting means comprises;

a clock detecting means magnetic directional coupler having a pair of  
10 magnetically coupled microstrip transmission lines positioned in a parallel relationship for receiving the spectral power density signals from the narrow band filter.

6. The clock and data signal recovery and generating apparatus set forth in claim 5, wherein the clock detecting means comprises;

a peak detector connected to one of the magnetic coupler microstrip  
15 transmission lines for receiving a magnetically generated signal of the coupler received spectral power density signals and for determining an absence of the magnetically generated signal as a loss of transmission line information indication.

7. The clock and data signal recovery and generating apparatus set forth in claim 6, wherein the clock detecting means comprises;

20 a narrow band amplifier having an input connected to an output of the other magnetic coupler microstrip line for generating the clock signals in response to receipt of the spectral power density information.

8. The clock and data signal recovery and generating apparatus set forth in claim 7, wherein the clock detecting means comprises;

variable magnetic delay means connected to an output of the narrow band amplifier for varying a phase of the clock signal generated from the spectral power density information.

9. The clock and data signal recovery and generating apparatus set forth in claim 8,  
5 wherein the variable magnetic delay means comprises;

a pair of magnetically coupled microstrip transmission lines with one microstrip transmission line having an input port connected to an output of the narrow band amplifier for receiving the clock signal and a through port connected through a first varactor diode to ground and with another microstrip transmission line having a coupled  
10 port connected through a second varactor diode to ground and an isolated port output.

10. The clock and data signal recovery and generating apparatus set forth in claim 9,  
wherein the variable magnetic delay means comprises;

a network having one end connected to the through port of the one microstrip transmission line and an opposite end connected to the isolated port of the other microstrip transmission line such that signals applied to a center point of the series  
15 network varies the phase of the clock signal.

11. The clock and data signal recovery and generating apparatus set forth in claim 10, wherein the clock detecting means comprises;

a combination of a narrow band amplifier coupled to a narrow band filter with the  
20 amplifier and filter combination having an input connected to the isolated port output of the variable magnetic delay means for amplifying the clock signal and eliminating high order harmonics appearing in the clock signal input.

12. The clock and data signal recovery and generating apparatus set forth in claim 11, comprising;

narrow band splitter apparatus having an input connected to an output of narrow band amplifier and filter combination for splitting the generated clock signal and having one output for applying the generated split clock signal to the data detecting means.

13. The clock and data signal recovery and generating apparatus set forth in claim

5 12, wherein the data detecting means comprises;

an amplifier having an input connected to another output of the narrow band splitter apparatus for amplifying the generated split clock signal.

14. The clock and data signal recovery and generating apparatus set forth in claim 13, comprising;

10 a central processor unit coupled with the clock and data detecting means for controlling operation of the clock and data detecting means.

15. The clock and data signal recovery and generating apparatus set forth in claim 14, comprising;

15 digital converter apparatus connected by a digital bus to the central processor unit and to the clock detecting means variable magnetic delay means for converting digital signals into varying signals applied to the series network to vary a phase of the clock signal.

16. The clock and data signal recovery and generating apparatus set forth in claim 15, wherein the data detecting means comprises;

20 a memory device having one input connected to the other microstrip transmission line of the directional coupling means for receiving the transmission line information output of the directional coupling means and another input connected to the digital converter apparatus for receiving control signals from the central processing unit determining a magnitude for recording ones of the transmission line information and for  
25 regenerating data signals from the received transmission line information in response to the clock signal applied to a clock signal input.

17. The clock and data signal recovery and generating apparatus set forth in claim 16, wherein the data detecting means comprises;

a data detecting means narrow band amplifier having an input connected to the one output of the narrow band splitter apparatus for amplifying the generated split clock  
5 signal.

18. The clock and data signal recovery and generating apparatus set forth in claim 17, wherein the data detecting means comprises;

a data directional coupler having a pair of magnetically coupled microstrip transmission lines one of which has an input connected to the data detector narrow  
10 band amplifier and an output connected to the clock input of the memory device for applying the clock signals thereto.

19. The clock and data signal recovery and generating apparatus set forth in claim 18, wherein the data detecting means comprises;

a peak detector connected to a second one of microstrip transmission lines of the data detecting means directional coupler for detecting an absence of magnetically  
15 induced clock signals and signaling the central processing unit the absence of the magnetically induced clock signals as a loss of clock signal.

20. Apparatus for recovering and generating clock and data signals from information received on a transmission line comprising;

20 clock detecting means for recovering and generating a clock signal from the received transmission line information;

data detecting means enabled by the recovered clock signal for recovering and generating data contained in the received transmission line information; and

directional coupling means having a pair of magnetically coupled microstrip  
25 transmission lines positioned in a parallel relationship for magnetically coupling the

transmission line information received on one microstrip line to the other microstrip line for transmission to the clock and data means

21. The clock and data signal recovery and generating apparatus set forth in claim 1, wherein the directional coupling means comprises;

5 a class B narrow band amplifier connected to one of the directional coupling microstrip transmission lines for receiving the magnetically coupled transmission line information and amplifying positive and negative pulses of the received transmission line information and applying the amplified pulses as a distorted sine wave to the clock detecting means.

10 22. The clock and data signal recovery and generating apparatus set forth in claim 21, wherein the clock detecting means comprises;

circuitry connected to an output of the class B band amplifier for defining spectral power density signals corresponding to a clock rate of the received transmission line information from the distorted sine wave and generating clock pulses therefrom.

15 23. The clock and data signal recovery and generating apparatus set forth in claim 22, wherein the clock detecting circuitry comprises;

a clock means directional coupler coupled to a peak detector and having magnetically coupled microstrip transmission lines for receiving the spectral power density signals and magnetically coupling the spectral power density signals to the peak detector for determining an absence of the magnetically generated power density signals as a loss of transmission line information indication.

20 24. The clock and data signal recovery and generating apparatus set forth in claim 23, wherein the clock detecting circuitry comprises;

a narrow band amplifier connected to the clock means directional coupler for  
25 generating the clock signals in response to receipt of the spectral power density information; and

a variable magnetic delay means connected to the narrow band amplifier and having a pair of magnetically coupled microstrip transmission lines with one microstrip transmission line having an input port connected to the narrow band amplifier for receiving the clock signals and a through port connected through a first varactor diode to ground and with another one of the microstrip transmission lines having a coupled port connected through a second varactor diode to ground and an isolated port output wherein a network having one end connected to the through port of the one microstrip transmission line and an opposite end connected to the isolated port of the other microstrip transmission line enables signals applied to a center point of the series network to vary the phase of the clock signals.

25. The clock and data signal recovery and generating apparatus set forth in claim 23, wherein the clock detecting circuitry comprises;

a combination of a narrow band amplifier coupled to a narrow band filter with the amplifier and filter combination having an input connected to the isolated port output of the variable magnetic delay means for amplifying the clock signal and for eliminating high order harmonics appearing in the clock signal input.

26. The clock and data signal recovery and generating apparatus set forth in claim 25, wherein the data detecting means comprises;

data detecting circuitry having a memory device with one input connected to the other microstrip transmission line of the directional coupler for receiving the transmission line information and another input for receiving control signals determining a magnitude for recording the transmission line information and generating data signals from the received transmission line information in response to the generated clock signal.

27. The clock and data signal recovery and generating apparatus set forth in claim 26, wherein the data detecting circuitry comprises;

a data detecting directional coupler having a pair of magnetically coupled microstrip transmission lines one of which receives the recovered clock signals for applying the received recovered clock signals to a clock input of the memory device and another one of the microstrip transmission lines for magnetically coupling the generated  
5 clock signals to a peak detector connected thereto for detecting an absence of magnetically induced clock signals as a loss of clock signal.

28. Apparatus for recovering and generating clock and data signals from information received on a transmission line, comprising;

directional coupling means having a pair of magnetically coupled microstrip  
10 transmission lines positioned in a parallel relationship for coupling a transmission line to the data and clock generating apparatus;

a class B narrow band amplifier connected to one of the directional coupling microstrip transmission lines for receiving magnetically coupled transmission line information and amplifying positive and negative pulses of the received transmission  
15 line information as a distorted sine wave;

circuitry connected to an output of the class B band amplifier for defining spectral power density signals corresponding to a clock rate of the received transmission line information and defining clock signals from the distorted sine wave;

a clock directional coupler coupled to a peak detector and having magnetically  
20 coupled microstrip transmission lines for receiving the defined clock signals and magnetically coupling the defined clock signals to the peak detector for determining an absence of the magnetically coupled defined clock signals as a loss of transmission line information indication;

a variable magnetic delay line and narrow band amplifier connected to the clock  
25 directional coupler wherein the magnetic delay line has a pair of magnetically coupled microstrip transmission lines with one microstrip transmission line having an input port

connected to the narrow band amplifier for receiving the defined clock signals and a through port connected through a first varactor diode to ground and with another microstrip transmission line having a coupled port connected through a second varactor diode to ground and an isolated port output wherein a network having one end  
5 connected to the through port of the one microstrip transmission line and an opposite end connected to the isolated port of the other microstrip transmission line enables signals applied to a center point of the series network to vary the phase of the received clock signals;

10 a combination of a narrow band amplifier coupled to a narrow band filter with the narrow band amplifier and filter combination having an input connected to the isolated port output of the variable magnetic delay means for amplifying the clock signals and eliminating high order harmonics appearing in the clock signal input;

15 data detecting circuitry having a memory device with one input connected to the directional coupler means other microstrip transmission line for receiving the transmission line information output of the directional coupling means and with another input for receiving control signals determining magnitudes for recording the transmission line information and regenerating data signals from the received transmission line information in response to the generated clock signals; and

20 a data detecting directional coupler having a pair of magnetically coupled microstrip transmission lines one of which receives the recovered clock signals for applying the received recovered clock signals to a clock input of the memory device and another one of the microstrip transmission lines for magnetically coupling the recovered clock signals to a peak detector connected thereto for detecting an absence of magnetically induced clock signals as a loss of clock signal.

25 29. A magnetic delay line for delaying and varying phases of clock signals, comprising;

a pair of magnetically coupled microstrip transmission lines positioned in a parallel relationship with one microstrip transmission line having an input port for receiving the clock signals and a through port connected through a first varactor diode to ground and with another microstrip transmission line having a coupled port connected through a second varactor diode to ground and an isolated port output and having a network with one end connected to the through port of the one microstrip transmission line and an opposite end connected to the isolated port of the other microstrip transmission line for enabling signals applied to the network to vary the phase of the received clock signals.

30. A method for recovering and generating clock and data signals from received transmission line information comprising the steps of:

coupling the received transmission line information to a data detector and regenerating data appearing in the received transmission line information, and

magnetically coupling the received transmission line information to a class B amplifier coupled to a clock detector and recovering clock signals used to generate data in the transmission line information.

31. The data and clock signal regenerating and recovering method set forth in claim 30, wherein the magnetically coupling and clock signal recovering step comprises the step of

generating magnetically induced clock signals from the recovered clock signals and varying phases of the magnetically induced clock signals to delay the recovered clock signals.